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THE

NATIONAL GEOGRAPHIC MAGAZINE

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THE

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The following articles will appear in the Magazine within the next few months:

"The Growth of Germany," by Professor J. L. Ewell of Howard University.

"The Dikes of Holland," by Gerard H. Matthes, U. S. Geological Survey.

"The Annexation of the West," by F. H. Newell, Hydrographer, U. S. Geological Survey.

"The Growth of England," by Dr Edwin D. Mead, Editor of the *New England Magazine.*

"The Native Tribes of Patagonia," by Mr J. B. Hatcher of the Carnegie Museum, Pittsburg, Pennsylvania.

"Explorations on the Yangtse-Kiang, China," by Mr Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtse-Kiang Valley.

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THE HARBOR OF MOLLENDO — PERU

THE
NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI JUNE, 1900 No. 6

THE ROAD TO BOLIVIA

By WILLIAM E. CURTIS

It takes seven days to make the voyage from New York to the Isthmus; three days from New Orleans, and two from Tampa; but the latter routes are impracticable on account of the quarantine regulations. There is always more or less fever at the Isthmus. It is difficult to keep it away, because Colon and Panama are filled with human driftwood and are asylums for refugees from plagues, politics, and criminal courts. The last yellow fever was brought to Panama, curiously enough, by seven friars from the Philippine Islands. They are all dead but one. Panama is the home of political exiles, unsuccessful revolutionists, and banished presidents of the Central and South American republics. It has a fine hotel, a number of handsome residences, and no end of ruins, which have been accumulating since the time when the governor of the first colony on the American Continent began a history that has no parallel for conspiracy and intrigue on the American Continent.

Usually the voyage from New York is delightful. People always expect a little weather off Cape Hatteras, but when you pass that unlucky coast and cross the Gulf Stream you put on lighter clothing and rejoice in the trade winds which temper the heat of the tropics. The days and nights are of equal length. The sunsets are as gorgeous as you see on the Mediterranean, and there is no twilight. The sun rises promptly at the time appointed in the almanac, and when his day's work is done he drops below the horizon as a tired sailor tumbles into his bunk.

As an Irishman would say, the first land you see is a lighthouse, striped like a stick of candy, that marks Watlings Island, where Columbus stumbled upon a new world. There is a little settlement of negroes and a white magistrate to represent the sovereignty of Queen

Victoria. After leaving Watlings the steamer treads its way through the Bahama Archipelago, giving the passengers a panorama of coral islands, where the sponge-fishers live, groves of cocoanut trees, and lonely lighthouses that guide the ship to Colon, which from the deck of a steamer is one of the prettiest towns on the coast, but when you get ashore is a disappointment and a delusion. The harbor is inclosed with beautiful hills, whose bright-green foliage never fades, and groups of palms nod lazily to each other as they admire the reflection of their own beauty in the water. The palm is the peacock of plants. It is the most graceful tree that grows, but you can't help despising it for being so vain and conceited.

The railroad company occupies one end of the town with shops and boarding-houses, and at the other end is a group of ornate and elaborate gingerbread villas erected for the comfort of the large and luxurious staff of the canal company. They had clubs, billiard-rooms, libraries, hospitals, and everything that a colony of cultured gentlemen could desire except churches. The French christened the canal company Christo Colombo, but the Americans call it Colon. One of the most beautiful and costly and at the same time inappropriate statues to the great discoverer overlooks the entrance to the canal. It was erected by the ex-Empress Eugénie, and represents Columbus in the garb of a student, with a benign expression on his countenance and his hands resting on the tresses of a crouching Indian girl.

A surprising amount of work has been done by the Panama Canal Company, contrary to an almost universal misconception that exists among the American people. De Lesseps dug two ditches, each about 18 miles in length, from Colon and Panama toward the center of the Isthmus, which are now partially filled with debris. The new company has been working in the interior, cutting through the summit of the continental divide, which here rises only 333 feet above the sea, and, with one exception, is the lowest point of land between Bering Sea and the Straits of Magellan. The great obstacle that stands in the way of the Panama Canal is the Chagres River, which receives the drainage of a large area and is perhaps the most depraved and unreliable stream in existence. There are two seasons, the wet and the dry. For five months it rains a torrent every day, a rainfall of about four feet a month. The remainder of the year there is no rain at all. Thus for five months the Chagres River is a Niagara, and for seven months a shallow, stagnant stream. The problem is to regulate the rainfall so that it will not wash the canal away in the wet season and leave the upper levels without water in the dry.

OPENING PEARL OYSTERS — PANAMA

Panama is one of the oldest and quaintest towns in America. Santo Domingo antedates it a few years, but it was the first settlement on *tierra firme*, and the ruins of the original city still lie on the shore of the bay four miles south as they were left by Morgan, the famous buccaneer, who burned and blew up 7,000 houses. The present city dates back to 1673. In 1849 it was the principal station on the route to California. In 1879 the Frenchmen came with their millions, and everybody had money to burn. Then, after a hysterical period, Panama settled down to the sleepy existence which it still retains. The harbor is beautiful, and a group of islands lying about two miles from the city is the headquarters of several steamship companies which furnish transportation facilities for the west coast of America.

The voyage from Panama south is one of the most fascinating and comfortable that the salt water affords. You are always sure of fine weather, fine ships, and a good sea. It never rains, it never blows, and the swell is not heavy enough to make ordinary people seasick. From Guayaquil to Valparaiso the passengers are almost always in

sight of the Andes, whose feet are buried in the desert lands, whose breasts are wrapped in the foamy clouds, and whose peaks are crowned with spotless snow. The spectacle of the Chimborazo rising like a king among an army of Titans is surpassed by few mountain views, and the scenery during the entire distance is always picturesque.

The temperature south of Panama is much cooler than north of the Isthmus, for the heat is tempered by the Humboldt Current, a cold stream that comes up from the Antarctic zone to cool the atmosphere of the west coast, just as the Gulf Stream brings the warm waters of the tropics to moderate the climate of Europe and North America; for you know that if it were not for the Gulf Stream everybody in New England would be living like the Eskimo and potatoes would not grow in Ireland.

We crossed the equator at six o'clock, Sunday, July 2, 1899. The thermometer stood at seventy-six degrees in the chart-room, on the shady side of the ship, and at seventy-eight degrees in the companion-way leading to the dining-room. On the Fourth of July, three degrees south of the equator, it was seventy-six at noon and eighty-one at four o'clock.

From the deck of the steamer in the evening, Guayaquil looks like a little Paris. It lies along the bank of the River Guayas, and the main street, called El Malecon, stretches for two miles or more from a shipyard to a fortress-crowned hill with two decrepit old guns, which are supposed to protect the harbor. El Malecon appears to be lined with long blocks of beautiful marble and stone, and in the evening is brilliantly illuminated. Here appears a row of palaces, then a group of clubs, and beyond a series of blazing ball-rooms. In the morning from shipboard the illusion is not dispelled, and the view is quite as imposing. The architecture is pure and graceful, much of the Moorish order, and the rest on more delicate lines—long arcades like those on the *Rue de Rivoli* or the *Palais Royale* of Paris, and above them balconies sheltered by blinds and awnings of gay canvas have an oriental look. A little railway, with tiny cars drawn by diminutive locomotives, carries heavy loads of merchandise, cocoa, and sugar between the docks and the warehouses.

An interesting kind of craft on Guayas River was called *caballitos*, or "little horses," which consists of bundles of rushes and reeds lashed together and forming a narrow float or raft that tapers off at one end like a gondola. They are as difficult to handle as a canoe, and are used chiefly for fishing. The *caballitos* look very frail and

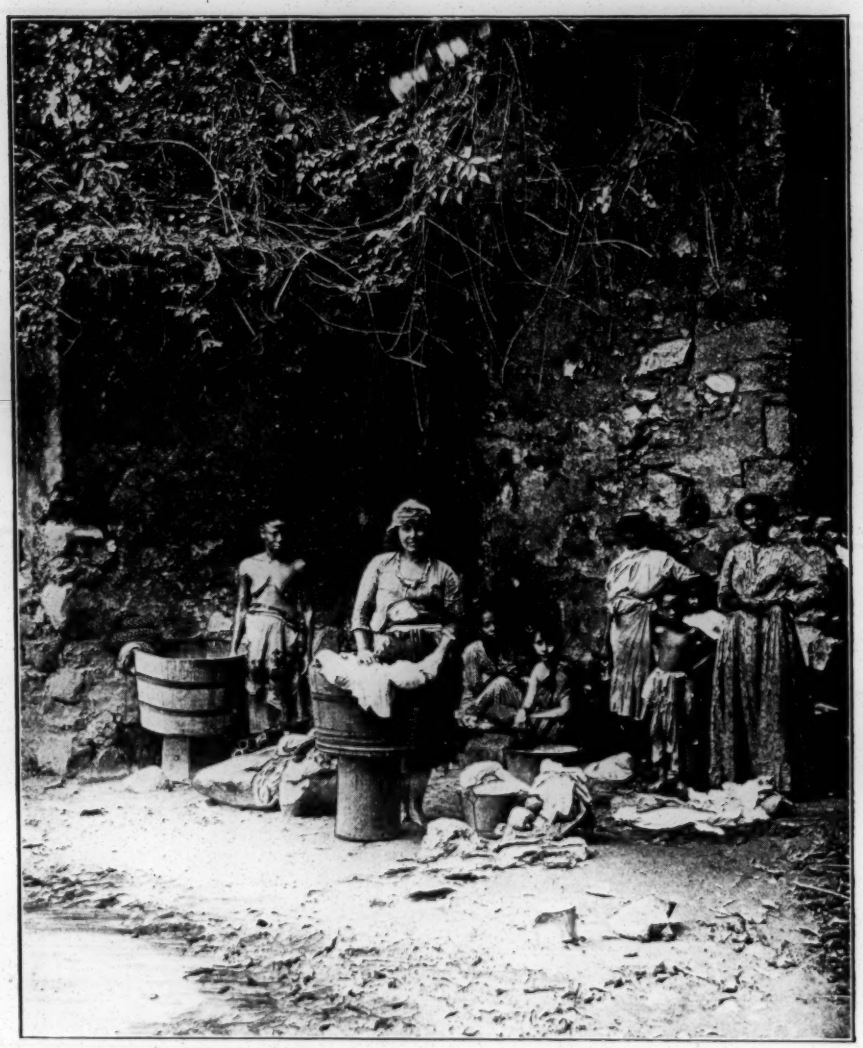
dangerous when you see them in the water, but it is impossible to sink them.

When you leave the Guayas River to go southward you strike the "Zona Seca," the desert coast, as soon as you pass the boundary of Peru. The steamer follows the shore as closely as safety will allow. The surf has pounded it until the soft places have yielded and its present outlines resemble the wind-carved cliffs on the American desert, and scattered along are many islands gray with guano, dropped by the millions of water birds that make their home along the way-worn and forbidding shore. There are a few indifferent harbors, but most of the towns lie upon the unprotected beach, and communication between the steamer and the shore is carried on in large launches, made so buoyant that they ride safely through the surf.

A CABALLITOS

Like the arid lands of Arizona and southern California, the desert coast of Peru is rich in vegetable life wherever it can be moistened. About once in a generation a shower escapes from the mountains, and the hitherto lifeless earth is immediately illuminated with fruits and flowers whose germs have lain dormant from remote cycles. In 1892 there fell a series of unprecedented rains. The desert was alive with plants and blossoms where nothing but lifeless sand had been before, and where the seeds came from is a question no one has ever been able to answer.

The steamer stops at every town for an hour or two, long enough to take on and discharge cargo, and the passengers can go ashore and enjoy diversions from the voyage, which are always interesting. We saw funerals and weddings and busy markets and many queer things unique to this locality.



A PANAMA LAUNDRY

Back of the port of Pacasmayo, across the desert and the first mountain range, is the town of Caxamarca, where the traveler may still see the remains of the palace in which Pizarro and his legions strangled Atahualpa, the last of the Incas, and butchered the members of his court after he had filled his prison with gold; and farther down the

coast, below Lima, in the midst of the desert, are the ruins of the ancient city of Pachacamac, the Rome and the Mecca of the Incas, where several square miles of roofless and crumbling walls stand as mute but impressive witnesses of the thorough manner in which the Spaniards civilized the new world.

Pachacamac was the Christ of the Incas, sent by his father, the Sun, to redeem the world, to give life to mankind and all things necessary for their well-being and happiness. But one temple in the entire empire was dedicated to that supreme being, to which pilgrims were continually coming and going, because it was the duty of every inhabitant once in his lifetime to offer sacrifices and worship there; and to be buried in the neighborhood of the temple was the supreme ambition of all believers. Immense buildings, now in ruins, were occupied by priests and nuns, who dedicated their lives to the service of the god, and surrounding them was an assemblage of spacious edifices adorned with enormous wealth, which furnished an irresistible temptation to the avaricious Spaniard. Francisco Pizarro sent his brother Hernando to plunder the city, and amazing stories are told of the silver and gold that he carried away. The ruins of Pachacamac remain as he left them, after he despoiled the temples and palaces and butchered the inhabitants. They are the most accessible as well as one of the most interesting examples of Inca architecture.

Surrounding the city is a cemetery that extends for many miles, where millions upon millions of pious Incas were buried during the centuries that preceded the Spanish occupation. The theory of the resurrection of the body and the immortality of the soul caused them to preserve the dead with great care, and to bury with them the utensils and ornaments which they used in life. Taking advantage of this custom, archæologists and treasure-seekers have excavated large areas in search of mummies, gold and silver ornaments, and other valuable objects that the graves contain. The cemetery has been the scene of such vandalism that it is now a repulsive golgotha, covered with skulls and bleached bones, broken pottery, and the cerements which have been stripped from the dead.

At the foot of the hill, where stood the Temple of the Sun, was a vast building, supposed to have been a convent, in which thousands of women spent their lives spinning and weaving robes for the royal family and vestments for the priests. Its noble walls have made a heroic resistance against time and decay during the four centuries since the Spaniards stripped them of their treasures. Under their

shadows we took our noon-day rest, eating luncheon and talking of the wonders and the mysteries of the sacred place, while a daughter of the Incas brought a bundle of sugar cane upon her back to feed our horses.

The west coast of South America has been called a panorama of desolation, being a constant succession of barren cliffs, with scarcely a lovely thing for 1,500 miles. The town of Mollendo, the terminus of the railway that connects Bolivia and the interior of Peru with the coast, is built upon a rock that extends into the ocean. Ugly looking crags project in all directions and make the landing look dangerous, although in reality they are a protection, by breaking the force of the surf that rolls in unbroken from the wide Pacific; for, as our captain suggested, what else can you expect when you have nothing else but Australia for a breakwater.

Although Mollendo is the second seaport in importance of Peru, the surf is so bad that people cannot always land there. Sometimes passengers on the steamers have to continue to the next port and remain until the surf subsides. At all times the experience of landing is not such as to encourage nervous and timid people, although it furnishes the passengers who are lucky enough to remain on board with some exciting and amusing spectacles.

The water used by the people of Mollendo is brought 85 miles in an 8-inch pipe, which lies partly under ground and partly on the surface of the desert, along the line of the railway from the River Chile which is tapped in the mountains at a height of 7,275 feet above the sea-level. Farther south, at Iquique, they have a similar pipe, which brings the water 148 miles, and that which supplies Antofagasta is 185 miles long. The water is used both for consumption and irrigation, and wherever it touches the soil there springs forth most luxuriant vegetation.

For the first ten miles out of Mollendo the railway runs along the beach; then it enters a *quedebra* or ravine, and begins its weary climb up the mountain side. It passes first through a region of rocks and sand upheaved by some great cataclysm, and continues to wind like a snake in and out of the irregularities of the mountains. There are double curves and serpentines and horseshoes, and at places you can see three or four levels, one above the other, on the same mountain. The first station after leaving the seashore lies at an elevation of 1,000 feet, and there is an average rise of 800 feet between stations thereafter until we reach Arequipa, which is about 8,000 feet above tidewater

There are no tunnels and only one bridge the entire distance, but the heavy construction is continued, the roadway being actually carved out of the rocks with shovels and picks and dynamite. The train creeps along at the rate of 10 miles an hour—an engine and two cars, the first a combination of second-class and baggage, and the other neatly upholstered for the use of the first-class passengers. At the stations piles of freight are awaiting shipment and droves of patient, melancholy burros, with monstrous heads and legs like pipestems, gaze indifferently at the train, as if unconscious of its competition.

At every station there is a long wait, and the passengers alight to buy food of the Indian women, who cook it on the spot. About half way to Arequipa appears a group of splendid mountains—Carachani, which is 20,800 feet; Coropuno, one of the highest peaks in South America, which measures 22,000 feet, and Misti, a slumbering volcano that rises from the desert like a stately dome.

At frequent intervals crosses have been erected where men have died, and there is a ghastly shrine hung with ribs, thigh-bones, skulls, and other melancholy reminders of the uncertainty of human life upon these awful deserts; some of the victims died of disease during the construction of the railway, others perished of thirst or exhaustion while crossing the pampas; all of them were once buried in the sand, but the wind uncovered their bones, which kindly hands have collected and hung about the emblem of the crucifixion.

Upon the desolate pampas of Peru is found an extraordinary phenomenon known as *medanos*—crescent-shaped piles of white crystals rising to a height of sometimes twelve and sometimes twenty feet at the center of the arc, and molded with perfect symmetry. The arms of the crescents are of equal length, and always point to the north. The *medanos* move continually, making an average distance of about 10 feet a month; but each pile keeps its own sand, and in a mysterious manner they never mix, nor do they increase in numbers. Veterans who have been passing over the desert for half a century claim that the number of *medanos* is no greater now than it was twenty-five or thirty years ago.

The valley broadens as you approach Arequipa, and its fertility is shown by an emerald ribbon that illuminates the gloomy grandeur of the scenery. Irrigating ditches creep around the mountain sides and empty their contents over the slopes. Farmhouses are built of loose boulders, without mortar, and are thatched with roofs of straw in the shape of pyramids, over which a coating of clay has been placed

A CENTRAL AMERICAN FAMILY — NICARAGUA

to protect them from the rain and wind. On almost every farm is a circular corral built of boulders, with a stone floor, in which the wheat is trampled out of the straw by the hoofs of the animals; and many other curious and interesting objects are seen on every hand.

Arequipa is a quaint and queer old town, and has the reputation of being the most religious city in the world. Freemasons are not allowed to live there, Protestants are ostracized, and the people devote a great part of their time to religious ceremonies. Again, it is equally famous for the purity of its atmosphere. The air is said to be clearer and the sky bluer than anywhere else. Being surrounded by deserts, every breeze that reaches Arequipa is sapped of moisture. Nothing putrefies; decay is arrested in animate as well as inanimate life, so that everything dead dries up and blows away.

Arequipa has been celebrated, too, for several centuries as a seat of learning and a center of literary life. The most influential citizens are the monks. It has produced many famous ecclesiastical scholars and statesmen, and, although its university is not so much sought by students as it used to be, many young men are sent there from all parts of South America to be educated.

Another source of satisfaction is that the old Spanish families have kept their blood pure and can trace their pedigree back further, it is claimed, than those of any other part of South America. Therefore they are proud—very proud—and exclusive. But pure air and pure blood are about all they have to brag of, for in the preservation of their dignity and the contemplation of their virtues they have little time to devote to their other pursuits, and poverty prevails to a most painful degree among some of the oldest and most aristocratic families. The women are beautiful; the men are reserved and austere. Progress and modern ideas are looked upon as an evidence of vulgarity, and the fact that Arequipa is so slow and old-fashioned is a matter of congratulation rather than regret.

Arequipa is the home of Señor Don Eduardo Lopez de Romana, the second civilian who has been president of Peru. A civil engineer by profession, he takes little interest in politics, which is a distinguishing characteristic in a country where politics has absorbed the attention of the people to a degree that has been seriously detrimental to its material interests. But what distinguishes Romana still more is that he did not seek the presidency—a fact absolutely unique in the history of the South American Republics.

Because of the arid climate and the absence of clouds, the city of

Arequipa was selected as the site of the astronomical and meteorological observatories of Harvard University. Observers are engaged in making a map of the heavens of the southern hemisphere, the elevation and the purity of the atmosphere enabling them to reach many stars that are not visible in other localities, while meteorological records of great scientific usefulness are made by automatic instruments on the top of the volcano Misti.

Passenger trains leave Arequipa for Lake Titicaca on Thursdays and Sundays at seven o'clock in the morning. Freight trains run every day. The track climbs around the base of the volcano Misti. The mountains are bare and seem to be composed of alternate layers of rock and baked clay. The latter looks like chalk and cuts like cheese. It was very convenient and useful for grading purposes, and on the mountain sides are great cavities, which were shoveled out for this purpose, whose walls are as regular and as smooth as if they had been done with a carving-knife. At intervals of a few miles are lovely valleys, showing where the water has been gathered and utilized for irrigation, for the soil is rich and produces in a most prolific manner anything that man can plant. Sugar cane and wheat grow side by side, cotton and corn intermingle their foliage, and potatoes and melons and ordinary vegetables and fruits grow as they do in California.

We cross the grand divide at Crucero Alto (The High Cross), a collection of adobe huts and a well-built station, upon the front of which is an inscription to inform the traveler that it is the highest point upon the railway and 14,666 feet above the sea. There are mining settlements in Peru at a greater elevation, but for many years this was the highest point in the world at which steam was used for motive power. The highest elevation ever reached by a railway is Galera tunnel, on the Oraya road of Peru, 15,665 feet. The inhabitants are mostly railway men, it being the end of a division, and the families of the shepherds who watch their flocks upon the pampas that surround it.

At Crucero Alto water freezes every night of the year, and the thermometer often falls to 6, 8, and 10 degrees below zero. There are no facilities for artificial heat, not even fireplaces, and people keep themselves warm by putting on ponchos and other extra wraps. At noonday the sun is intensely hot, because of the elevation and rarity of the atmosphere, and blisters the flesh of those who are not accustomed to it. There is a difference of 20 and sometimes 30

degrees in the temperature of the shade and the sunshine. Water will freeze in the shade, while in the sunshine twenty feet away men may be working in their shirt-sleeves.

The natives seem to be entirely inured to cold, and go about barefooted and barelegged over the ice and stones, and have a way of heaping blankets on their heads and wrapping up their faces to keep the pure air out of their throats and nostrils. The women who herd the flocks are often out on the mountains for weeks at a time without a shelter or anything to eat except parched corn, strips of dried meat, and cocoa leaves, which are the most powerful of nerve stimulants.

THE MOST INFLUENTIAL CITIZEN OF AREQUIPA

From Crucero Alto, the highest town in the world, the southern railroad of Peru drops into the Lagunillas, the lake region of the Cordillera, where, 14,250 feet above the sea, is a group of large lakes of very cold pure water, without inlet or outlet, that receive the drainage of a large area and conceal it somewhere, but there is no visible means of its escape. A fringe of ice forms around the edges of the lake every night the year round.

A curious phenomenon about the lakes is that they keep the same level all the time, regardless of the dry and rainy seasons. No amount of rain will make any difference in their depth, which, however, in the center is unknown; and this adds to the awe and mystery with which they are regarded by the Indians. There are no boats upon the lakes except a few small balsas or rafts made of bundles of straw, which keep very close to the shore for fear of being drawn into whirlpools that are said to exist in the center. There is some foundation for this fear, for only two or three years ago a balsa containing five men disappeared in the darkness and was never heard of again.

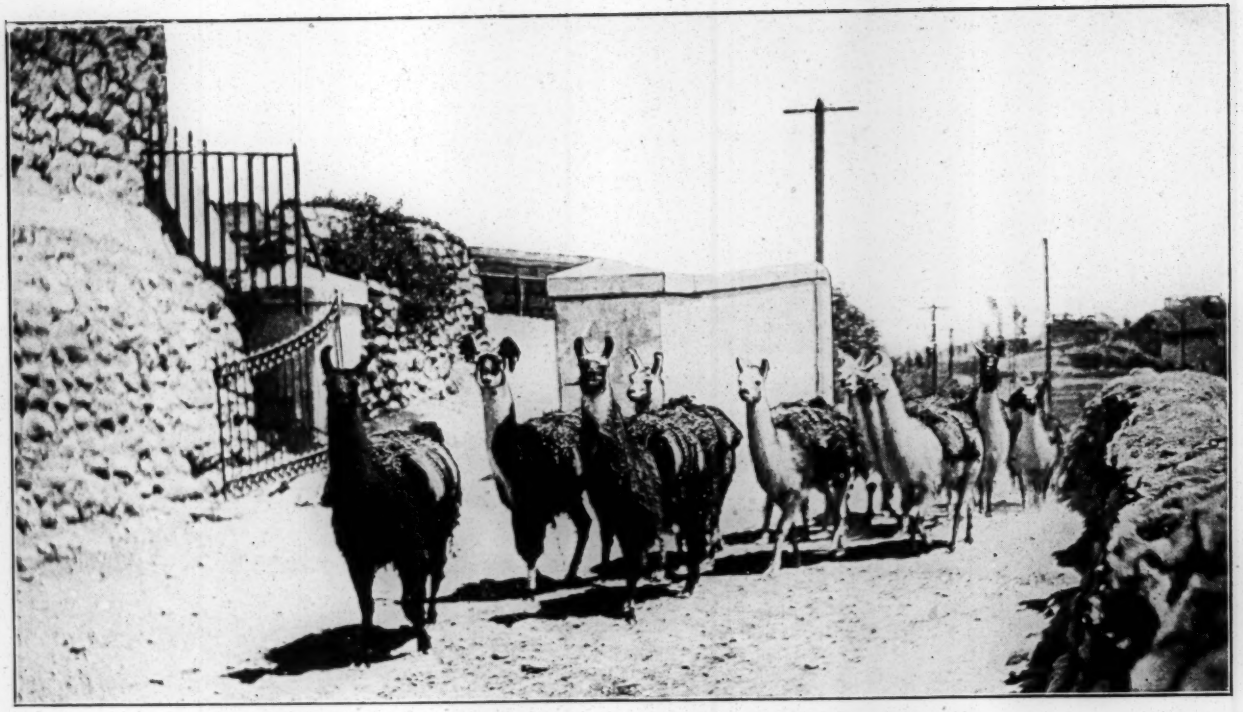
In the whirlpool near the center of Lake Popo, which receives the waters of Lake Titicaca, hundreds of men have lost their lives. Boats that are drawn into the current are whirled swiftly around a few times and then disappear. For the protection of navigators the government of Bolivia has anchored a lot of buoys in Lake Popo, and boatmen who observe them are in no danger.

There is supposed to be an underground outlet from all of these lakes into the ocean. Articles which have been thrown into their waters have afterward been picked up on the seacoast near Arica, and on the beach in that locality are frequently found cornstalks, reeds, and other debris which do not grow on the coast, but are found in great abundance among the interior lakes.

After crossing the grand divide at Crucero Alto, you enter the great basin that lies between the two ranges of the Andes, and is known to the natives as Puna, 500 miles in length and from 20 to 300 miles in width. Before the conquest it was the most populous and productive part of Peru and the center of the great Inca empire. On either side this mighty table-land is supported by the buttresses of the Andes and the Cordillera, and the ranges of snow-covered peaks can be seen to the east and to the west from every eminence, a vast chaos of mountains, ranges, and cross-ranges, bleak, barren, and lifeless.

In no part of the world does nature assume more imposing forms or offer more striking contrasts. The deserts and the mountains are as bare and repulsive as the Sahara, but the valleys are as luxuriant and productive as those of Italy. Eternal summer sits side by side with everlasting winter, and the perfume of flowers and fruits is borne across repulsive wastes of sand and rock. Under these conditions the Incas maintained a government, the first known to the world in which the equal rights of every human being were recognized; a community that anticipated the ideas of modern socialism; that worshipped a god whose instincts and attributes were almost parallel with those of Jehovah. Men who have shivered in the snowy mountains recognized the sun as the source of heat and light, the greatest blessing they enjoyed, and gave it the chief place in their pantheon.

The railway through the mountains of Peru is said to be the best in South America. It has a fine track, quite as smooth as any we find in the United States. Most of the freight is furnished by the mines—silver, copper, and gold ores. A considerable quantity of wool is exported; also a few hides. The inward freight is merchandise for Bolivia and Cuzco, and supplies for the mines. The greater part of



TRANSPORTATION FACILITIES OF INTERIOR PERU

it appears to have come from Germany, and it is remarkable how rapidly the Germans are absorbing the commerce of this country.

There are fine cattle on all the ranges, much better than on the lower altitudes, and as the train approaches the center of the basin the population seems to increase and appears more prosperous, until we come to Juliaca, where the railroad divides, one branch running to the city of Puna, Lake Titicaca, where a line of steamers furnishes transportation to Bolivia, and the other to the ancient town of Cuzco, the capital of the Inca empire.

Four hundred years ago Cuzco was the most important city in America, with a population of 200,000 or more and a wealth that few communities of human kind have ever surpassed. It is now a dismal, dirty, half-deserted habitation of from 30,000 to 40,000 ignorant and indolent Indians, with perhaps 500 or 600 whites, who own the property and conduct what little business is done there. Cuzco was the residence of a long line of kings, who lived in splendid circumstances, surrounded by courts of enormous riches, and remarkable taste for art and architecture, considering the isolation in which they lived and their ignorance of other nations beyond the mountains and ocean that confined them.

Each successive Inca built a new palace at Cuzco, and several erected temples and convents that rivaled the royal residences in extent and magnificence. It is almost impossible to believe the narratives of writers who went there with Pizarro and witnessed the city before it was plundered and destroyed; but the ruins are mute witnesses of its former opulence and power. The means of grace are abundant—for a population of less than 40,000 there are 30 churches and 11 convents and monasteries, which are marvels of architectural beauty. The courts and cloisters of the convents are admirable in their proportions and challenge admiration with the great cathedrals and monasteries of Europe. In La Mercede lie the remains of Juan and Gonzalvo Pizarro, the brothers of the conqueror of Peru, and those of Almagro, his partner in the conquest. These temples were more splendid in their day than anything that existed in the new world, but are now the crumbling victims of time and negligence.

[*To be concluded in the July number.*]

THE COLONIAL EXPANSION OF FRANCE

By Professor JEAN C. BRACQ,

Of Vassar College

It was not till the end of the fifteenth and the beginning of the sixteenth century that France attained anything corresponding to her present extent on the European continent and began seriously her extraterritorial expansion. The establishments made by French traders upon the Gold Coast and the Ivory Coast, in the fourteenth century, and the conquest and conversion of the people of the Canary Islands, in 1402, by Jean de Bethencourt, had foreshadowed what was to come. But the beginning of real expansion rose upon the west coast of France. Basque and Breton fishermen went early to the distant north, to Iceland and Labrador. It is probable that they visited Newfoundland before Cabot, for they fished there at an earlier period than the English. Later following the examples of the kings of Spain and England, the King of France became interested in the exploration of the new world. Verrazano, in the service of France, visited the Atlantic Coast of North America in 1523, and eleven years later Jacques Cartier, ascending the St Lawrence, opened boundless possibilities of expansion for France in the new world.

MOTIVES ANIMATING THE FIRST FRENCH COLONIES

Religious considerations predominated over secular ones in many ventures made at this time. In view of the precarious situation of Protestants, Admiral Coligny wished to establish on the American Continent colonies which, in case of need, would be possible places of refuge for French religious dissenters. Sixty-five years before the sailing of the *Mayflower* he endeavored to found a colony in South America, and six years later one in Florida. The first failed because of the inexperience of the colonists, and the second was destroyed by the Spaniards because of its Protestant character.

There are many who are fond of explaining most of the determinations of French history by racial factors, and erroneous ones at that. It is well to remember that though the French are Latins by their language and by much of their culture, they are, like the British, predominantly Celto-Germanic in blood. They have an ethno-

graphical peculiarity which, in the past, has always fostered colonial enthusiasm. They do not easily isolate themselves from society. Solitude is not pleasant to them; they are too communicative for that. Their thought more naturally seeks outward expression than concentration. An almost irresistible impulse leads them to wish to impart to others the principles and ideas which they value for themselves. Touch them strongly with religious emotion and they become missionaries. Thus France has more Catholic missionaries than all the other Catholic countries taken together. One cannot speak too highly of their zeal, of their almost complete surrender of selfhood, of their devotion, which at times attains the purest forms of heroism.

Though chartered companies were at work, it was predominantly a religious motive which led to expansion in Canada. Quebec, ever a very religious city, was founded by Champlain, a very devout man. Montreal from the first was a center of missionary and philanthropic effort on behalf of the Indians. The missionaries and the *courreurs de bois* radiated in every direction, the former to win souls and the latter for the satisfaction of a restless spirit; together they won a new empire for France. The loftiest possible aims predominated in this movement. Their ideal, to unite the whole Indian population into a great Christian confederation, was in perfect keeping with Henry IV's dreams of universal peace.

Meanwhile, under Richelieu and Colbert, expansion was taking place in other directions, reaching Guiana, some islands of the West Indies, and Senegal and Réunion Island in the Indian Ocean. The westward advance of Nicolet was contemporaneous with the first possession of Madagascar. While La Salle was working toward the Mississippi, France was expanding in India. Now was her golden opportunity in North America; but many causes in no wise connected with the colonial capacities of the nation were at work to prevent her from making the best use of her opportunity.

REASONS OF THE FAILURE OF FRANCE TO RETAIN HER COLONIES IN AMERICA AND INDIA

Like other nations of the times, France had an inadequate appreciation of the economic value of colonies. To her North American possessions she preferred colonies yielding tropical produce and spices, like the West Indies. She did not care to encourage the production of articles common to Canada and to France. Then emigra-

tion upon any large scale was prevented by the fact that the people did not feel the penury of land as in some countries. Another national trait worked in the same direction. Love of order, which led France to impose rules upon religion, politics, art, and literature, brought needless restraints. There were no commercial, no municipal, and no provincial liberties. Love of consistency demanded the introduction of feudal institutions, some of which have survived to this day. The people, suffering at home from them, found no incentive to go to the colonies, where they would still be under the same restrictions. The intolerance of the clergy in Canada produced similar results. They opposed the advent of Protestants. The whole history of America would have been different had the Huguenots been allowed to settle in New France. Then, men like Laurens, Boudinot, Jay, Marion, De Lancey, De Peyster, De Pew, and thousands whose virtues and intelligence were so potent in building up the best life of this Republic, would have wielded their influence in Canada.

A fact of transcendent importance in determining the fortunes of the French colonies was the geographical position of France herself. Had she been an island her transatlantic history would have been different. She would have kept aloof from those numerous continental contentions into which at times she entered on account of the necessities of her position, but more often for futile motives and with disastrous results. However, the ultimate fact which shaped the fate of Canada was the mother country. The expansion of a country can go on satisfactorily only in so far as it is supported by a sound national life. The reign of Louis XIV was bound to be fatal to the colonies because of its abuses and disorders. Nothing could have saved finances at the mercy of a personal power surrounded by flatterers, courtesans, and mistresses. The ruin of the national finances entailed the ruin of the navy. No navy, no colonies. The resultant of these causes led naturally to the Treaty of Utrecht in 1713, the first important colonial collapse of France.

The reign of Louis XV did not alter for the better the working of causes which had proven so fatal. The results of the national life led to the Treaty of Paris in 1763, which involved the total surrender of Canada and the vast domain of India to England, and Louisiana to Spain—almost the whole colonial domain. The most intelligent part of the French population had a very inadequate sense of the loss. Argenson had already said that if he were the King of France

he would give all his colonies for a pin's head. Choiseul was glad to give Canada to England, because American colonies, delivered from the presence of the French, would revolt against their mother country. France is not now grateful to him for his practical joke, though it was against England. Voltaire refers to the whole Ohio basin as "a few acres of snow." Among other things, he expresses the very charitable wish "to see Canada at the bottom of the sea." The wise Montesquieu is not wiser. "Kings," he says, "should not dream of populating great countries by colonies. . . . The ordinary effect of colonies is to weaken the country whence they are drawn without populating those to which they are sent." Economists insisted that the process was ruinous. Philosophers and philanthropists objected to colonies because of the presence of slaves in most of them. So indifferent was the French government that, before signing an alliance with the American colonists, it made a formal renunciation of its North American possessions, and in the sweeping arraignments of the *Ancien Régime* not one refers to the loss of a vast colonial empire.

To this blind indifference to transatlantic colonies there were some exceptions. Many Frenchmen realized the importance of the Newfoundland fisheries, and France clung tenaciously to them. Notwithstanding the clearness of French rights, Englishmen did their utmost, on the morrow of the Treaty of Paris, to deprive Frenchmen of their privileges. This intensified in the French heart the bitterness felt against an enemy which, however admirable in some respects, had never displayed any generosity in victory and seldom any fidelity to its treaties. The hypothetical explanation by Professor Seeley of the wars between England and France during 100 years as a competition for the new world is one of those fascinating generalizations of historians which, on the French side at least, has but a slender support. Frenchmen, in all the wars of the Revolution and of the Empire, seldom thought that they were contending for a vast empire. In their eyes it did not appear worth the powder burned. How could the Revolutionists, busy at home with a program of reforms never attempted at one time by any nation, contending against local uprisings and against united Europe, think of the colonies that they had lost? Although they defended the colonies that were left to them, the solution of the problem of freedom upon the continent reacted in some colonies. When the Revolutionists decreed the abolition of slavery the San Domingo Royalists signed a treaty with England that they might keep

their slaves. As to Napoleon, Europe was the field of his ambition. If he thought of India, it was that he might strike his enemy at her most vulnerable point. Had he cherished the designs ascribed to him by Seeley, he would never have sold Louisiana to the United States. His wars left France diminished, not only in Europe, but also in other parts of the world. The strategic position of the Indian Ocean, the island of Mauritius, was ceded to England, and with it, through the astute governor of that island, was raised the problem of Madagascar.

THE BEGINNINGS OF THE NEWER EXPANSION IN AFRICA AND ASIA

The Restoration was timid in its defense of French colonial rights. Its power, restored by foreign bayonets, was so unsteady at home that it could do little abroad and cared to do but little; yet it was this same Bourbon government that inaugurated the newer expansion, which was destined to better fortune. This expansion, unlike that of England, was not the result of a well-concerted design, but of imperative necessity. The Algerians, unmindful of the lessons which they had received in 1815 from Admiral Decatur, and in 1817 from Lord Exmouth, were desolating the Mediterranean coasts, and especially the coasts of France. France reluctantly took Algiers. The Orleanists accepted the campaign in Algeria as a troublesome inheritance, and gallantly attempted its never-ending conquest. Here France faced some of the most fearless warriors of the world—men whose bravery was heightened by religious fanaticism. England has never found upon her path such an ethnic and religious barrier. Some public men, even as late as 1845, proposed to abandon the province to its own fate. This, fortunately, was not done; but, on the contrary, the French flag was planted upon French Kongo and Grand Bassam, in Africa, and upon important groups of the Polynesian islands.

During the Second Empire colonial interests did not receive the attention which they deserved. Colonial preëminence in distant lands demands the preëminence of colonial interests at home. Not art, not philosophy, not science, not social life, but colonial aims, should be first in the national thought. This was far from the case during the Second Empire. However, the pacification of Algeria was progressing and French rule was extending southward. Napoleon encouraged the enlargement of Senegal eastward and took possession of Obok, near the Red Sea; New Caledonia, in the Pacific, and Cochin China, in Asia.

The Third Republic marks a signal advance. To some, colonies seemed poor compensations, but nevertheless compensations for Alsace. The brightening of the situation in Algeria was an incentive for wider experiments. The consciousness of the growing inferiority of France in territorial extent as compared with the great powers of the world also encouraged the expansion idea. The objection that the stationary population of France is fatal to expansion is rather an argument for it. The birth-rate of Frenchmen has always been higher in the temperate colonies than at home. In Algeria it is 15 per thousand higher than in Vermont and 11 higher than in France. In Tunis it is double that of Vermont and 14 per thousand higher than in France. This, however, is not of much moment, inasmuch as most of the French territories cannot become the permanent home of Europeans.

COLONIES ESSENTIAL TO A GREAT POWER

Colonies, to many, have appeared necessary to progress, and their lack or their subordinate importance as leading to retrogression. "Colonization," says M. Paul Leroy-Beaulieu, "is for France a question of life and death." It means self-propagation and self-protection. In order not to be behind the great powers, she must share in that great movement of territorial enlargement which is a common trait of great nations.

Without the shedding of much blood, France established a protectorate over Tunis. Senegal became the starting point of a march eastward, continued until the French flag waved over Timbuktu, the mysterious city of Tennyson, "shadowing forth the unattainable." French Guinea, the Ivory Coast, Dahomey, and the French Kongo were extended eastward and northward until they met, and with the Sahara, Tunis, and Algeria formed a continuous whole from the Kongo River and the Ubangi to Algiers, practically the whole of northwestern Africa, with the exception of important territorial indentations on the coast held by different European powers and Morocco.

On the east side of Africa, France endeavored to regain Madagascar, whence she had been so cleverly expelled by Lord Farquhar. She succeeded in establishing a protectorate, and as the Hovas eluded its consequences in 1895, General Duchesne led a brave little army to the heights of Emyrna and seized the capital, Antananarivo. Diplomatic considerations led France to annex the island, though her intention was only to secure a real protectorate.

At the same period she advanced from Cochin China and Cambodia to Anam, Tonkin, and Laos. The whole Mekong Valley thus opened to her, and the territories to the east constitute what is now known as Indo-China. She is thus well situated for a work of penetration into China. Indo-China contains about 285,000 square miles, and is therefore larger than the South Atlantic States. This makes France an Asiatic as well as an African power.

Her colonies are seventeen times larger than her own European territory. Those of Africa are thirteen times her size. After making allowances for the worthlessness of a large part of these territories, there still remains an empire five or six times as extensive as France, with immense economic possibilities.

THE REACTION OF COLONIZATION ON FRENCH LIFE AND THOUGHT

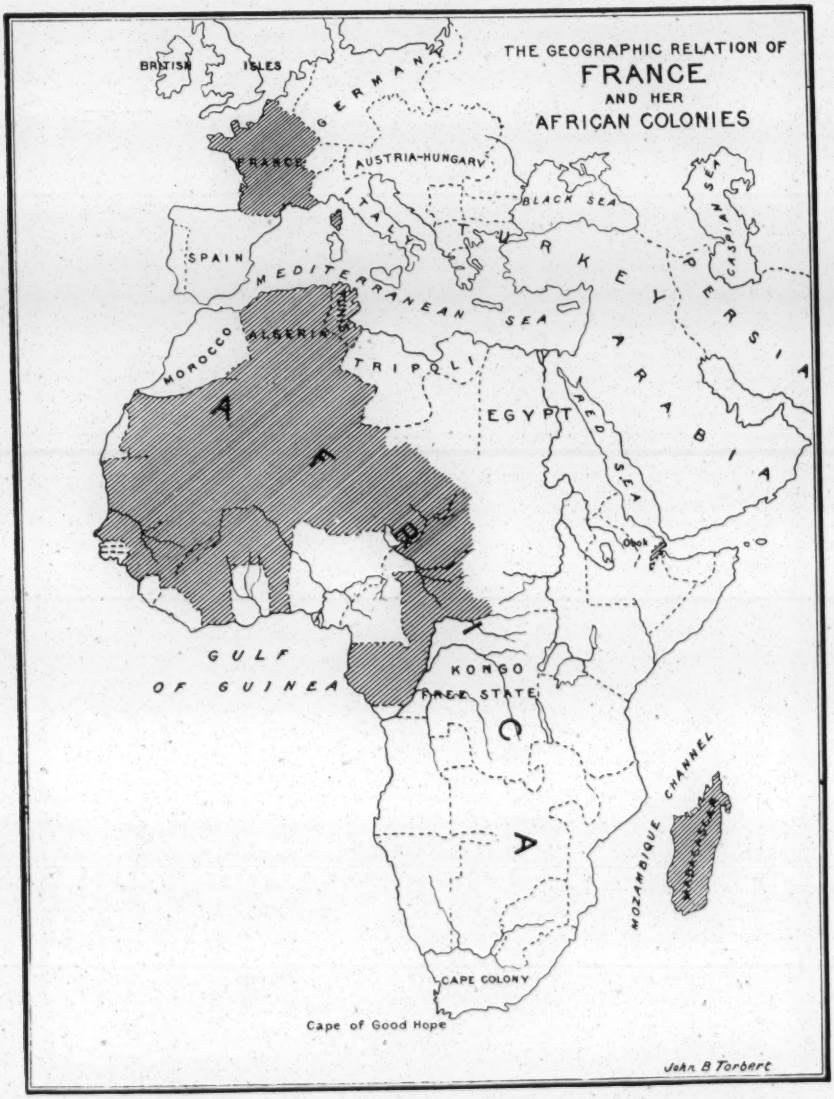
This expansion is not only the realization of a national purpose, but the outlet of a new life which has arisen during the Republic. Some have spoken of the unusual development of the army and navy, but this is only a part of a larger movement that has manifested itself by a corresponding educational, scientific, artistic, industrial, philosophical, ethical, and religious development. Even though appearances may be to the contrary, never has France seen such a display of national energy. The territorial expansion has called for the coöperation of every one of these forces and modified them. The army has witnessed its own transformation, not only by the introduction of new picturesque African and Asiatic elements, but by changing the soldier in the colonies into an overseer, a teacher, a gardener, a farmer, or a road-builder; it is modifying the national education. The contact with varied ethnographical types forces Frenchmen to reconsider their fundamental conception of man.

This movement, as well as the development of interest in the science of geography, contributed to a vast work of exploration. The list of French explorers during the Third Republic is as long as it is choice. Galiéni, De Brazza, Gentil, Mizan, Monteil, Binger, Fonté, and Marchand are names long to be remembered in France for their services, no less to their country than to the cause of knowledge. Science, enriched by enormous contributions to geography, botany, anthropology, and ethnography, is helping in return. Scientific literature relating to the colonies is accumulating. Colonial methods have become rationalized, as may be seen in Tunis, Madagascar, and Indo-China. Fearless and able historians are shedding

light upon past colonial errors. Artists are turning to new fields with enlarging results, and men of letters are beginning to paint the life of the new possessions.

At the same time an important change has been taking place in the French mind in reference to colonial life. With the telegraph and the newspaper, the Frenchman has no longer the aversion to colonization which he had in former days. Soldiers ask to remain in the colonies when their service is at an end. Many are happy in their new home beyond the sea. The *Comité Dupleix*, in Paris, works to increase their number. The government, with all its changes and inconsistencies, has had a definite program to consolidate the different parts of French North African possessions into one vast empire. Everywhere are springing up schemes for new railroads and for the use of watercourses. The railroads of Algeria and Tunis are extending. That between the Senegal and the Niger River is advancing. Among the schemes most strenuously advocated is the Trans-Saharan Railroad, which would take passengers from London and Paris to Lake Tchad in less than six days. With the recent conquest of Insala, this road is a colonial necessity. The gradual advance of France southward has changed all the conceptions previously entertained concerning Africa. So, too, there has been aroused an ambition for a Greater France, extending from Calais to the Kongo Free State—a France scarcely intercepted by the Mediterranean Sea, with Algiers not more distant in time from Paris than Omaha is from New York, and with Lake Tchad within as easy access as is the Pacific Coast from the same city. This view is not widely entertained, but it is rapidly gaining ground and the people are fast becoming colonialistic.

Let us now consider the positive, permanent results of French colonization. It is impossible to pass by the French colony of Canada. After 137 years of British rule, it is still French and unassimilated by its conquerors. In fact, the reverse in some places is true. There are names of Anglo-Saxon origin, such as Donaldson and MacGregor, borne by men who do not speak English. The French constitute an important factor in the destinies of Canada. Their bi-lingual education gives them a great advantage. There are those among them who hold high places in literature, some are eminent in the judiciary world, some are professors in the universities, and the prime minister is a French-Canadian. The population of Mauritius, not unlike that of Canada in character and condition, is still very strong in its French sympathies. It may be said that if the French of Mauritius remain


THE GEOGRAPHIC RELATION OF
FRANCE
AND HER
AFRICAN COLONIES
BRITISH ISLES
GERMANY
FRANCE
AUSTRIA-HUNGARY
ITALY
BLACK SEA
CASPIAN SEA
SPAIN
MEDITERRANEAN SEA
TURKEY
PERSIA
MOROCCO
ALGERIA
TRIPOLI
EGYPT
ARABIA
RED SEA
GULF OF GUINEA
KONGO FREE STATE
MOZAMBIQUE CHANNEL
MADAGASCAR
CAPE COLONY
Cape of Good Hope
John B Torbert

untouched by English institutions, those of Réunion seem to have been unaffected by the thought and life of contemporary France. The remnants of the old French possessions of India are not of much moment. St Pierre and Miquelon, near Newfoundland, generally known as St Pierre, are serving an important national purpose. They are the center of fisheries so extensive that at least 40,000 persons in France and in St Pierre depend upon them. They are also nurseries of well-trained seamen, indispensable to the French navy. It should be remembered that these colonies are but dislocated fragments of two vast colonial empires, and that their experiences prove nothing as to French colonial ability.

FRENCH COLONIES IN ASIA

Of the newer colonies, there are the Polynesian possessions, which, territorially, are not very important, but whose value will be greatly affected by the American trans-isthmian canal. The most promising is New Caledonia. It has the advantage, which so many French colonies lack, of being very rich in minerals, the extraction of which has proven very remunerative. Though a penal colony, it is attracting from France new elements, whereby the wealth of the island will be developed.

While making mistakes of policy and of judgment, France has achieved many beneficent results in Indo-China. She has introduced an order in the country which had never existed before; has organized the finances, and instituted regular budgets. That of Indo-China in 1898 had a surplus of nine million francs. She has introduced the *état-civil*, which is a great instrument of social security and social justice. She has established schools, model farms, important railroads, telegraphs, river navigation, quays, beautiful buildings, and extensive public works. Commerce has increased, and a study of the number of Frenchmen who have settled in this colony as compared with the Englishmen who have settled in India would be to the advantage of Indo-China.

MADAGASCAR, THE SAHARA, AND TUNIS

Africa seems to be the great sphere of French expansion. On the east side she has Obok, close to the southern entrance of the Red Sea. Its value is largely strategic. It has a good harbor, good water, and the territory is said to contain much coal.

Madagascar is one of the most hopeful colonies. The work of France here has been both destructive and constructive. She has overthrown the despotic Oriental government of the Hovas. The insurrection which followed was not so much the result of French conquest as the continuation of the movement of the *Fahanalos*, outlaws who for many years had been a very disturbing element. General Galiéni, in a most humane manner, restored order. The island is now more pacified than it ever was during the last ten years of the Hova government. The tribes are happy to have their own tribal chiefs and to be delivered from the former Hova governors, hated by all. Slavery has been abolished. State compulsory labor has been freed of its worst and more arbitrary features. The state church, with its official hypocrisy, has been disestablished. The schools, founded by the missionaries before the conquest, have gained in number and character. In the province of Emyrna, French Protestant missions have 800 schools; the Catholic, 700; the English and Norwegian missionaries, 250, and the government, 150. All fair-minded men must recognize that missionaries have never had a truer freedom nor a truer security in the island than now. France has constructed important public works. She has built roads from the capital to the coast on two sides of the island which previously was roadless. Now heavy trucks drawn by oxen take the place of men's backs in the transportation of goods from the coast to Antananarivo, the capital. This work will be done before long by a railroad. Telegraphic lines built by France extend in many directions. An extensive agricultural development is taking place, and a new life has dawned for that interesting island.

The field which is likely to undergo the greatest immediate changes is that immense possession south of the Sahara. With the exception of Senegal and other establishments upon the western littoral, the whole territory is as yet but very imperfectly organized. Vast districts have never been explored. Recent applications for concessions have been great. Three-quarters of the French Kongo have been leased by French companies, forty of which during the last year have here invested no less than $10,000,000. Whatever may be the economic future of this section of Africa, some positive results, which cannot but be approved by all, are already visible.

First, there has been an overthrow of the cruel African despots—black Caligulas—represented by Ahmadon, Behauzin, and Samory; second, the stopping of the slave trade, with its indescribable horrors; third, the great efforts made to bring back the natives to agriculture,

from which they have been driven by wars or slave trade; fourth, the rapid building of roads. One, 560 miles long, binds Timbuktu with Dahomey, and another of 500 miles forms the chord of an arc described by the bend of the Niger River. Miss Mary H. Kingsley, the remarkable English lady traveler and scientist, has testified to the beneficent influence of France upon that part of the Dark Continent. When the Senegal-Niger Railroad is finished and the Trans-Saharan built, under the blessings of *Pax Gallica*, a life never dreamed of will spring up in these territories.

Tunis is one of the most successful colonies of the world. The following facts concerning the work of France there are indisputable: First, she has introduced a security of life never known before; second, she has improved the finances; third, she has given a great impetus to agriculture and brought Tunis in touch with the markets of the world; fourth, she has greatly ameliorated the administration of justice; fifth, she has given a great impetus to education; in 1892 the budget for that purpose was between 160,000 and 180,000 francs; sixth, over 600 miles of railroad have been built. Roads have been constructed upon a large scale. In fact this has been one characteristic of the expansion of France in Madagascar, in Senegal, Algeria, and Tunis. With the recent stupendous development of the automobile and its introduction into the colonies, the building of these roads is of the greatest significance. Algeria is the most important achievement of France because of the internal development of that colony and its organic relations with continental France. Algiers, the former stronghold of African piracy, has become safer than London, and Algeria as safe as France. Though colonization in South Africa began in 1652, the Dutch and the British have not attracted thither many more than 700,000 Europeans. In 70 years France has drawn to North Africa 600,000 Europeans; and if she has had the advantage of nearness she has not had that of rich minerals, which are such demographic magnets. I have an absolute confidence not only in the power of Frenchmen to make the natives accept the present regime as the will of Allah, but in the ultimate reconciliation of both races. France has all along shown her genius to win to her men of other nations and races. The Navarrese united to France are most loyal, while those of Spain are still restless. Alsace, though ethnographically Germanic, longs to return to France. Corsica, though Italian, is attached to her Gallic conquerors. Savoy, after some 40 years of union, displays an unquestionable loyalty. In every French colony one sees signs of the growing attachment of the

natives. The English and the Dutch have perhaps secured more respect from the inferior races, but the French more love.

For a long time Algeria had as its governor the distinguished gentleman who now represents France so ably in the United States, M. Jules Cambon. To him more than to any other living man, French North Africa owes its encouraging advance. He has helped all to secure the best advantages from the juxtaposition of two forms of society and two civilizations, with their conflicting aspirations.

ECONOMIC ASPECTS OF FRENCH COLONIZATION

It is an extraordinary fact that with an energetic utilitarian foreign population, which, like all such aggregations, are impatient at any obstacle to their gains, the natives in Algeria should have kept to this day twelve-thirteenths of their soil. France has protected them with a real solicitude. They are ruled by Moslem law and by their own judges when they form homogeneous communities. They are gradually assimilating something of the western spirit, and this to an extent of which they are not conscious. The parts which are predominantly peopled by Europeans enjoy institutions almost identical with those of France. It is her policy to give her colonists the same institutional advantages which they would have enjoyed at home. St Pierre has all the administrative and educational machinery of the mother country. Catholics, Protestants, Hebrews, and Moslems in Algeria receive similar state support. The educational machinery of France has been extended there; efficient common schools, academies and colleges, schools of law, medicine, pharmacy, science, and *belles-lettres* have been established. Young women have a *lycée* in Oran, and able courses of secondary education are organized for them in several cities.

The economic condition is steadily improving. The railroads which at the outset were considered the wildest speculation are fast approaching the remunerative point. Rich deposits of phosphates have been discovered in southern Algeria and Tunis. It is almost certain that there are further south large quantities of nitrates. These may prove to be the gold mines of North Africa.

Algeria and Tunis not only furnish their own food and that of the French garrisons, but they have a large export account. In a fair year it amounts to 3 or 4 million quintals of wheat, 4 or 5 million hectoliters of wine, more than a million sheep, 60 or 80 thousand oxen, 100,000 quintals of wool, large quantities of tobacco, iron, zinc,

and lead ores. The neighborhood of Algiers is the winter garden of Paris, sending daily during the season steamers to Marseilles loaded with garden produce, which is distributed through France. More and more a twofold current of life binds Africa with France and France with Africa. French civilization moves southward with its imperfections, with the usual concomitants of such movements, but also with blessings unspeakable for the natives. It is not astonishing then that the north African colonies should excite a very legitimate enthusiasm among Frenchmen. M. Paul Leroy-Beaulieu says: "Algeria and Tunis are and will remain the first European colonies of Africa." The late Grant Allen has expressed the desire that in the interest of civilization the beneficent French power, as Hamerton puts it, might ultimately be permitted to extend over Morocco.

The natives under France have, as a whole, suffered less from their contact with European civilization than those under other great powers. Were Parkman still among us, he might repeat, concerning the lower races that come in touch with France, what he said of the Indian: "Spanish civilization crushed the Indian; English civilization scorned and neglected him; French civilization embraced and cherished him."

French expansion should not be judged by its economic results; yet even from that point of view it is gradually becoming more satisfactory. The trade of the colonies reaches $231,000,000, $160,000,000 of which is with France. Were she to allow her colonies to levy duties upon metropolitan goods, most of them would have a large surplus. But even though they are not self-supporting, neither are all the departments of France. The spirit of national solidarity which embraces poor departments must also prevail in the colonies; yet it must be admitted that the French colonies still cost far too much, and that 85,000,000 francs or $17,000,000 a year is excessive, though there are many signs that the regular demands upon the budget will soon decrease.

The colonial expansion of France has not only influenced for good the peoples whom it has reached and reacted favorably upon the French themselves, but it is also working for international enrichment. Temporarily her fiscal measures, at some particular points, may disturb certain old trading establishments of foreign houses, but the development of the new countries and the increase of wealth will counterbalance these obstacles, and the most intelligent producers will have the best economic possibilities, for after all these possibilities are "mightiest in the mightiest."

THE PREVENTION OF HAILSTORMS BY THE USE OF CANNON*

In 1896 the Honorable Albert Stiger, mayor of Windisch Feistritz, in Styria, revived an old custom of the preceding century, usually termed "weather firing." Formerly the firing was from ordinary mortars, but Mr Stiger introduced several modifications. He found that by the use of a funnel attached to the mortar the efficiency of the shot could be greatly increased. His machine was constructed on the following lines: A heavy block of oak or tough wood was hollowed out so that it could be fastened securely to the mortar by iron clamps, and an iron funnel was then screwed to the block of wood. The funnel is made of sheet iron 2 millimeters thick and has a diameter at the upper opening of 70 centimeters, while at the lower opening its width is only 20 millimeters. In 1897 as many as 36 of these firing stations were established.

At first Mr Stiger's experiments were sneered at and made the sport both of scientists and of the unscientific. But nevertheless the severity of the hail, which every year since the seventies had wrought great damage in Styria, ceased in Windisch Feistritz, while in the neighboring districts it became even more destructive. Gradually the belief in the efficacy of "weather shooting" as a protection from hail spread to the wine-growing districts in the vicinity of Styria. Here also the experiments proved a great success, and were then taken up by Lombardy, Piedmont, and the other provinces to the south. Then the Italian deputy, Dr E. Ottaviri, visited Windisch Feistritz and became also a convert to Stiger's system of weather shooting. He returned to Italy, and under his leadership similar apparatus, called Stiger cannon, were rapidly manufactured and set up, especially in Tuscany and Emilia; also an astonishing number of shooting associations sprang up, each with its individual station. In the summer of 1899, the first in which the cannon was used in Italy, no less than 2,000 stations were equipped on the Stiger pattern, and all were very active during the season. The Italians in fact became so enthusiastic that a congress was summoned and met November 6–8, 1899, in

*An abstract of an article from the *Wiener Abendpost*, by Dr J. M. Pernter, director of the Imperial Institute of Meteorology and Magnetism of Vienna.

Casale Monferato. At this congress the minister of agriculture was represented by the under secretary of state, and the ministries of war and the interior also sent delegates. Five hundred participants in the congress appeared, some of them the most distinguished scientists of Italy. Mr Stiger was elected honorary president, and a committee of four eminent professors, representing Styria, Piedmont, and Venice, were appointed to report on the results of the Stiger method for preventing damage from hail. The committee unanimously agreed that "if the shooting was commenced in time the damage from the hail was always averted." A number of instances were cited showing that in the towns where there was no shooting the destructive violence of the hail continued unabated, whereas in the districts where the shooting was done no hail occurred.

Mr Stiger, the inventor, however, particularly warns the public against being oversanguine, as he asserts that, in spite of the many successful results obtained by his process, there is not yet the certainty of its effectiveness.

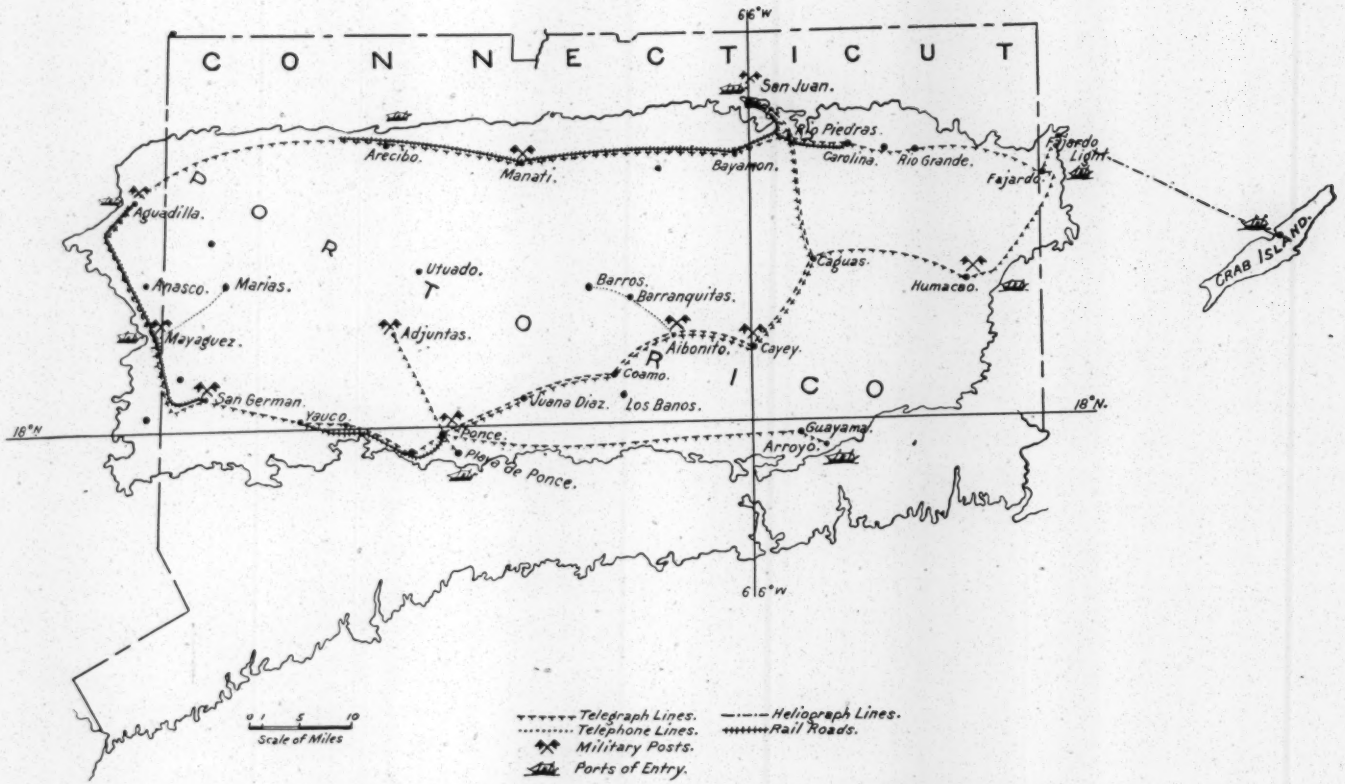
Every one is naturally asking the question, How can the formation of hail be influenced by "weather firing"? I confess that I am not able to answer, but I must assert that because we cannot comprehend the process we have not the right to deny its existence. In explaining the action of the cannon, two points are to be considered—the effect of the explosion and the force of the vortex ring that rises from the gun barrel. In the sultry, distressing calm that precedes violent storms it is almost a natural necessity to make a noise, and as loud a noise as possible. One feels that from the sultry calm before the storm misfortune is to come, and that by disturbing the stillness the misfortune may be turned away. Mr Stiger states that he was guided by this thought when he began his experiments in 1886. "The observation," he says, "that every hailstorm is preceded by an absolute stillness of the air, accompanied by heavy oppression, suggested to me the idea of disturbing this calm which seemed essential to the formation of hail, and therefore I tried 'weather shooting,' which has been known for centuries."

That vibrations can destroy the formation of hail has no foundation in physics. As far as our knowledge reaches, for we do not yet understand the hail-forming process, the explosion could not affect the process, either through changes in the clouds, or by the premature freezing of droplets through concussion, or through a considerable concussion.

We must therefore turn to the second hypothesis, that the effect of the vortex ring from the cannon prevents the formation of hailstones. Mr Stiger has from the beginning ascribed the successful results from his machine to the effects of the vortex rings. In an official report of an expert from the Imperial Institute, who was sent to investigate the experiments made by Mr Stiger in 1897, the following statement is made: "It was shown that by the discharge of a shot a vortex ring similar to the common smoke ring is produced and can be seen in reflected sunlight. The ring rises rapidly with a distinct whistling, which is audible at a great distance. Observations showed that this whistling could be heard for 13 seconds, and in calms for more than 20 seconds."

A swallow which was once struck by one of these vortex rings fell dead, such was its tremendous force. Mr Stiger estimates the effectiveness of the shots and the shooting apparatus from the duration of the whistling of the vortex ring. Step by step the size of the mortar, the depth and breadth of the bore, the form and height of the barrel, the weight of the powder, have been carefully determined by experiment, until a most effective combination has been attained. In some experiments, at which I was present, I saw the vortex ring shoot upward against the clouds like a shot from a gun barrel, and distinctly heard the whistling for 20 to 28 seconds. The astounding force of the vortex ring was best demonstrated by the horizontal shot. A series of peculiar targets were placed at distances of 40, 60, 80, and 100 meters. When the vortex ring struck the targets it threw down poles which were braced with heavy linen cloth, burst through paper targets in which the paper had a resistance of 12 kilograms, tore loose clamps, and broke one clamp which was 3 centimeters long and $1\frac{1}{5}$ centimeters broad. A large bulldog which was in the way of the vortex ring was tumbled over twice and lost all desire for further observation.

In this mechanical power of the vortex ring we have found the force which may possibly influence the process of hail formation. Unfortunately, as I have mentioned before, we know too little of the process of hail formation to be able to explain more clearly the action of the vortex ring, which certainly exerts a considerable force to a height of from 1,500 to 2,000 meters.



MAP SHOWING MILITARY TELEGRAPH LINES IN PORTO RICO OPERATED BY THE SIGNAL CORPS, U. S. ARMY, MILITARY POSTS, PORTS OF ENTRY, AND AREA COMPARED WITH THAT OF THE STATE OF CONNECTICUT

THE U. S. SIGNAL CORPS IN PORTO RICO

Through the courtesy of General A. W. Greely, Chief Signal Officer, U. S. Army, the NATIONAL GEOGRAPHIC MAGAZINE is enabled to publish the accompanying outline map of Porto Rico, prepared by Major W. A. Glassford, Signal Officer, Department of Porto Rico. This map shows existing railroads, ports of entry, and the telegraphic, telephonic, and heliographic systems of communication operated by the Signal Corps of the Army.

RUSSIAN RAILWAYS

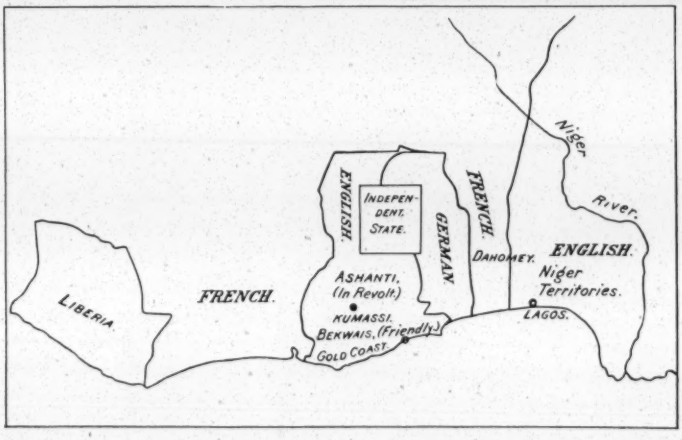
The phenomenal growth of Russia in industry and trade during the last ten years is in large measure due to the gradual reorganization and rapid extension of her railway lines. Until 1889 the government was compelled yearly to meet a heavy loss on all railways which it had guaranteed, but gradually separate roads have been purchased, agreements have been made with a few larger companies, and new lines have been constructed by the government itself. As a result 60 per cent of Russian railways are now entirely in the hands of the state, and instead of showing a heavy deficit, yield a surplus. During 1899, 75,710,000 passengers were carried on Russian roads, which, with only a few gaps, run from the White to the Black Sea, and from the Baltic to the Yellow Sea. The rates of fare on Russian lines are the lowest in the world.

DR H. S. PRITCHETT, who will assume the presidency of the Massachusetts Institute of Technology in the fall, will be succeeded as Superintendent of the U. S. Coast and Geodetic Survey by Mr O. H. Tittmann. No man in the United States is better qualified by experience and ability than Mr Tittmann to be the head of this important scientific bureau. He entered the service in 1867, when a boy of seventeen, and has gradually won his way from the lowest to the highest grade.

THE REVOLT OF THE ASHANTIS

During the last week of April the Ashantis in great force surrounded Kumassi and fiercely attacked the fort. Though they were beaten off with severe loss, they renewed the attack several times during May, and a general state of insurrection now prevails in the country.

Until 1894 Ashanti was a powerful confederation of tribes, which successfully withstood subjugation at the hands of the English from the Gold Coast Colony, though their capital was conquered and the kingdom much reduced in 1874. In 1895, when the confederation became weakened by the secession of a number of tribes, a permanent English garrison was stationed in Kumassi, and the kingdom came in fact within the English sphere of influence. Kumassi is about three miles in circumference, of an oval shape, and surrounded by an unhealthy swamp. The population probably does not exceed 20,000, of whom not more than 25 are Europeans. It is stated that the garrison of the fort, numbering 358, included only 18 Europeans, the rest being native allies, principally, from the Fanti tribes along the coast and Mohammedan Hausas, who have immigrated from the Niger districts of the interior.



Reinforcements are on the way from Sierra Leone and Lagos, but from the coast they have to march 180 miles, for the most part through a wilderness of swamp and virgin forest, before reaching Kumassi. The population of the Gold Coast Colony (this does not include the tribes of the Ashanti confederation) is estimated at about 1,500,000, and is friendly to British rule. They could not, however, render the English much effectual assistance against a determined revolt of the Ashanti tribes, as they are of a mild and inoffensive disposition. No estimate of the numbers of the Ashantis in rebellion can be formed, but the statement that they muster some 50,000 warriors is not improbable, and most of them are armed with old-fashioned percussion-cap guns.

Ashanti is famous for its gold and goldsmiths, and for skill in the weaving of cotton. The climate has the reputation of being the most deadly in the world for foreigners of every nationality.

GEOGRAPHIC MISCELLANEA

A BROCHURE containing every decision of the U. S. Board on Geographic Names is now in press and will soon be ready for distribution. The Board, which has recently been enlarged, consists of Henry Gannett, chairman; Marcus Baker, secretary; Andrew H. Allen, Otis T. Mason, H. G. Ogden, A. B. Johnson, Harry King, Major James L. Lusk, A. Von Haake, H. T. Brian, and John Hyde.

THE *Meteorological Chart of the Great Lakes*, which was last year issued monthly during the season of navigation by the U. S. Weather Bureau as an experiment, will hereafter be a permanent feature of the Weather Bureau work. The chart proved so serviceable in 1899 that it is now indispensable to vessels sailing between the Lake ports. It is edited by Prof. A. J. Henry and Mr Norman B. Conger, of Detroit, Mich.

FOR the first time in its history the actual sea-levels, mileage, latitudes and longitudes of the Mississippi River are being determined. The work is in the hands of the Mississippi River Commission, the board of army and civilian engineers charged with the duty of improving this vast watercourse. As years of experiment and more or less defined effort at improvement have not resulted in permanent good all along, the commission has wisely decided to survey the entire system and triangulate every foot of its course.

THE telegraph line begun five years ago to connect Victoria Nyanza with the east coast of Africa has been completed. One of the practical uses of the line will be to give warning to Lower Egypt of the state of the water on the Upper Nile, information that will in some cases be worth millions of dollars to the people of Lower Egypt, who depend on the river for their irrigation water. The railroad which is being built along the same route is now in operation to Kiu, about 270 miles inland. To complete the remaining 400 miles will require three years.

THE HAVOC that can be wrought by the hurricanes which periodically devastate the Greater, and especially the Lesser, Antilles will soon be reduced to a minimum, owing to the effective work of the U. S. Weather Bureau. Gradually meteorological stations are being established at all points on the Gulf of Mexico, the Caribbean Sea, and in the West Indies from which advance warnings can be cabled. The most recent of these stations is that at Turks Island, at the extreme southeastern end of the Bahamas, where Dr H. C. Frankenfield is now engaged in putting in the necessary apparatus.

THE concession by the Chinese Government allowing steamers of the river type to navigate the inland waters of the empire has proved worthless in fact. A dispatch to the London *Times* from Shanghai states that the Shanghai customs Taotai have refused to permit a British vessel to trade between that city and the Chusan Islands, only a few score miles distant from the mainland. This is only one of many similar refusals, with the result that nearly all the steamers that were specially built and sent to China for coastwise and interior trade either remain tied to their docks or have been sent back to England by their British owners.

Two prizes, the first of $150 and the second of $75, were offered in 1899 by the National Geographic Society for the best essays on Norse discoveries in America. The competition closed December 31, 1899. By the decision of the Board of Judges, consisting of Henry Gannett, Geographer of the U. S. Geological Survey; Albert Bushnell Hart, Professor of History in Harvard University; Dr Anita Newcomb McGee, Acting Assistant Surgeon, U. S. Army; John Bach McMaster, Professor of History in the University of Pennsylvania, and Dr Henry S. Pritchett, Superintendent of the U. S. Coast and Geodetic Survey, the first prize has been awarded to Charles B. Dalton, of New York City, and the second prize to Kenton Foster Murray, of Norfolk, Virginia.

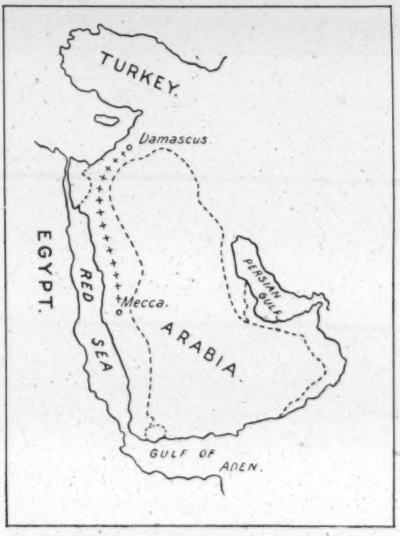
That the ant in the tropics is much more important as a geologic agent than the earthworm of temperate regions is maintained by J. C. Branner, Professor of Geology in Leland Stanford University. Professor Branner discovered new proof in favor of his theory during several months passed in Brazil in 1899, which he publishes in the last number of the *Journal of Geology*. In the city of Theophilo Ottoni the streets had been in many places cut down through rock which in places was decayed, and in some of the fresh cuts he saw holes made by ants penetrating the ground to a depth of ten, twelve, and even thirteen feet. Naturally the ants do not bore into the hard undecayed rocks, but the opening up of the ground by their long and ramifying underground passages hastens decay, and the working over of the soil contributes to the same end.

The gold-bearing area of Cape Nome and the copper fields in the vicinity of Copper River and Mt Wrangell, the most important field for exploration in Alaska at the present time, will be carefully surveyed by parties from the U. S. Geological Survey during the coming summer. The extent of the gold belt that passes through Cape Nome is unknown, but it is believed to cover an area of from 3,000 to 4,000 square miles, all of which needs to be mapped and prospected. Mr Alfred H. Brooks, geologist, who, in company with Mr F. C. Schrader, visited Cape Nome in 1899, and Mr E. C. Barnard, topographer, will direct the geologic and topographic parties at work in this territory, and hope to bring back a map of the gold area on the scale of four miles to the inch. Another party, led by Messrs W. J. Peters and T. C. Mendenhall, is to trace the extension of the gold belt to the northeastward and determine how far it penetrates into the interior of Alaska.

Two billion five hundred million dollars of German capital is invested in agricultural, industrial, and commercial enterprises beyond the seas; nor does this enormous sum include the foreign securities held by Germans. In Mexico German interests are estimated at $95,000,000; in Central America and the West Indies, $60,000,000 each; in the north of South America, $47,000,000; on the west coast of South America, $70,000,000; on the east coast, $140,000,000; in Persia, Arabia, and British India, $12,000,000; in southeast Asia, $60,000,000; in east Asia, $17,000,000. In North Africa Germans possess plantations and industrial works worth $2,500,000; in West Africa, $1,000,000; in Cape Colony, $9,000,000; in the Transvaal, $240,000,000; in Portuguese Africa, $5,000,000 In Turkey Germans have invested about $7,000,000 in landed property and $60,000,000 in industrial enterprises, mainly railways, not including $95,000,000 which the Bagdad-Busra Railway will cost. German interests in the United States and Canada are estimated at from $1,000,000,000 to $1,250,000,000.

THE loss of life from lightning in the United States was greater in 1899 than in any other year for which statistics have been compiled. Prof. A. J. Henry, in the current number of the *Monthly Weather Review*, states that 562 persons were killed outright or suffered fatal injuries, and 820 persons received injuries varying from a slight shock to painful burns and temporary paralysis of some part of the body. In fatal cases death was usually instantaneous. The most common form of disability resulting from lightning stroke was a partial paralysis of arms and legs. The zone of danger from a stroke of lightning is apparently larger than the common belief, namely, that in a single discharge from cloud to earth or earth to cloud the zone of danger does not exceed a few inches. But several instances of death by a lightning bolt would seem to show that the influence of a single bolt is not so confined. Professor Henry cites an accident where a span of horses attached to a wagon and a man in the rear of the wagon were killed by a single bolt, while the driver in front was not seriously injured.

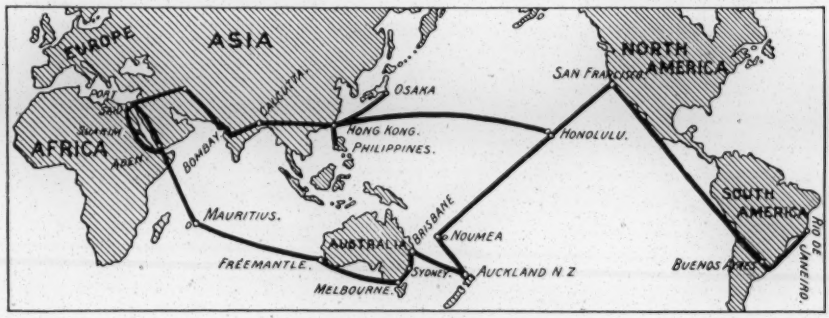
MECCA, the sacred city of the Mohammedan world, where for centuries no Christian has entered except by stealth, will soon hear the whistle of an American locomotive. A railway from Mecca to Damascus is now being surveyed by a commission of engineers appointed by the Sultan, and a railway battalion is to be specially created by the war office to take charge of the work of construction. The significance of the road is not so much in its commercial importance as in the revolution it means to Ottoman traditions, and in the fact that the Sultan has not been compelled by foreign powers to agree to the construction, but is himself its originator and promoter.



Two thousand five hundred miles of telegraph and cable lines are now in operation in the Philippines, every mile of which has been laid or reconstructed by the U. S. Signal Corps since the battle of Manila Bay, two years ago. Six thousand five hundred messages are flashed over these lines daily, all on government business, civil or military. Because of the vast volume of official business the lines cannot be used commercially, but such use is hoped for in a few months. Many of the lines have had to be rebuilt several times, as in the mountainous districts the insurgents cut them down when they raid the valleys. A network of wires covers Luzon, with only two gaps. One of these is strategically important, as it prevents the southern half of the island from communicating with Manila. The passes through which the line would pass are held by the insurgents. Panay, Negros, and Cebu also have the beginnings of a similar network, and the first cable in the system to connect all the islands has

been laid between Cebu and Leyte. The Signal Corps is making the connections by cable as short as possible, as the frequent earthquakes play havoc with submarine lines.

THE grip of the bubonic plague on every continent has tightened. In San Francisco six deaths from the disease have occurred and the board of health has officially proclaimed its existence in the city. Effective quarantine of Chinatown and inoculation will probably prevent a further invasion of the United States. In India the difficulty of dealing with the disease has been greatly increased by a protest of the Mohammedan population in Bombay



THE EXTENT OF THE BUBONIC PLAGUE

By courtesy of the *New York Herald*

against the precautionary measures being taken by the Indian Government. At Manila, Philippine Islands; Osaka, Japan; Sydney, Melbourne, and Brisbane, Australia, and Auckland, New Zealand, many fatal cases have occurred. At each of these cities infected rats were found on the wharves. On the southeast coast of Africa, in Mauritius, at Suakin, on the Red Sea, at Cairo, at Port Said, at the northern end of the Suez Canal, and at Rio de Janeiro, Brazil, the disease is also planted.

FROM St Petersburg to Vladivostok by way of the Arctic Ocean is the plan of itinerary of an exploring party that early in June leaves the former city on the steamer *Aurora*. Six scientists and twelve sailors, all experienced in Arctic travel and led by Baron Toll, make up the party. Their special object is the careful exploration of the Arctic regions north of Siberia. After a brief stop at Tromsö, Norway, and at the new Russian port of Catherine Harbor, on the Lapland coast, they will proceed to the Taimur Peninsula, west of the Yenisei River, and there establish their winter headquarters. The neighboring territory is to be explored during the winter of 1900–'01. On the breaking up of the ice, about August, 1901, they plan to push on to Sannikoff Land, discovered by Baron Toll in 1886 and as yet unexplored, and later farther northward to Bennett and De Long Islands, following the routes of the *Jeannette* in 1881 and of the *Fram*. The winter of 1901–'02 will be devoted to determining whether this group of islands extends to the Pole. When the water route reopens in 1902 they will resume their voyage to Bering Strait and reach Vladivostok in the fall of the same year.

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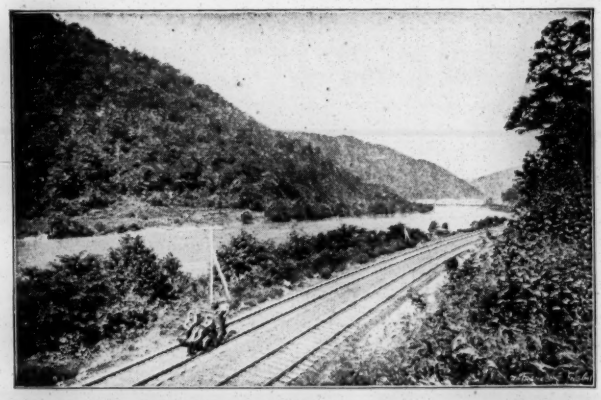

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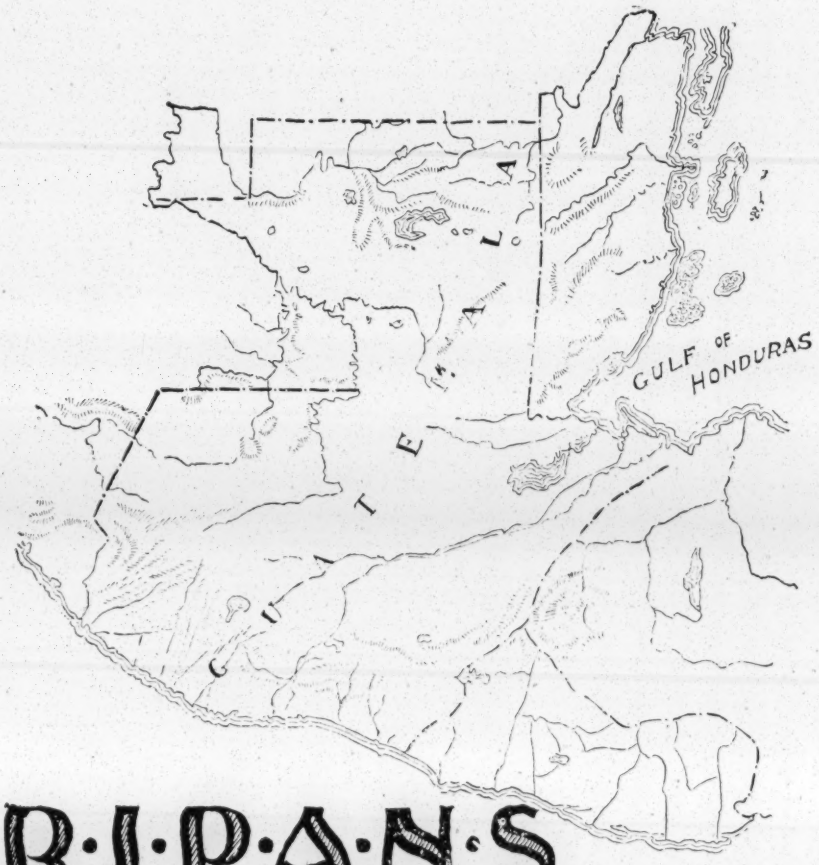

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